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Certain Observations of the Midland Salt-Springs of Worcester-shire, Stafford-shire and Cheshire.

Of the Crude Salt, which grows from the Stone-powder dejected by the said Brines in Boyling. Of the specifick difference betwixt Sea Salt and Common Salt.

A way (which seems to be the true method of Nature) of Distilling Sweet and Fresh Water from Sea Water, by the Breath of Sea Plants growing in it.

That this Breath probably is the Material Cause of the Trade or Tropick Winds. In a Letter to the Publisher from the learned Martin Lister Dr. of Physick of the University of Oxon.

S I R,

I Made all the *Wiches* or noted salt Springs in my way home from *Bath*, the last Summer, and spent some few hours in the examining of them. And what particulars I found over and above not mentioned in the *Phil. Transact.* ^f where they are very accurately writ of, I am about to tell you, as follows.

But before I proceed I must needs bear witness to the truth^s of Dr. *Guidots* experiments, most of which I tried my self at *Bath*, and find him to be a most *Authentic*, and faithful writer. I do only yet doubt of the existence of *Bitumen* for I cannot find the Floating Scum when dried to have any such thing in it.

At *Northwich* in *Cheshire* upon the *Weever* in 4 Pits is great plenty of *Brine*, it stinks of *Sulphur* Apparently in all the *Pits*; it becomes *Atramentous* with *Galis*.

Here are used *Sand Pans*, which are let down in the Corners of the great *Iron Boilers*, before the Salt shoots into grains, and these catch the Sand.

^f N. 53. N. 54. N. 142.

Besides there are thick *Stone Flakes* raised from the Bottom of the said *Iron Boylers*, once a week.

N. B. Within half a Mile of these *Brine Pits* at *Marberry* a *Salt Rock* was found by the *Augur* in boring for *Coals*^a.

Here, and at *Midlemich*, also at *Nantwich* and all along the *River Weever*, which are places many miles distant, sink on either side of the *River*, and you will scarce miss of *Brine*, as I was credibly informed by the most knowing men in that particular: But yet it proves a venture whether the *Brine* will be strong enough to boyl, and turn to Account; and for this Reason their *Pits* sometimes fail them, to their great loss (as they shewed me one, which had been wrought to very great profit,) by a small sweet Spring breaking into it, and sometimes the *River Weever* it self does them this mischief.

Aⁿ *Nantwich* upon the same *River*, is one very large *Brine-Pit*: This water also plainly smells as it were corrupted, or like *Sulphur*, but notoriously upon a few days forbearance of the *Pit*. It becomes *Atramentous* with *Galls*.

It yeilds a *White Sand* or *Stone* adhering in the manner of thin Scales to the Bottom of the *Iron Pans*, in which the *Brine* is boiled. And thus much of the *Cheshire Brine Pits*.

Weston Brine Pit near *Stafford*. This water in the *Pit* stinks like rotten *Eggs*: with *Galls* it becomes suddenly *Atramentous*. It Purges and Vomits violently, and that drank in a small Quantity. Here are used *Sand-pans*, to catch the white Sand, and there are flakes of *Stone* also, raised from the bottom of the great *Iron Boylers*.

Droitwich in *Worcestershire*. The upper *Wich* or *Brine-Pit* is very neatly kept, and exceedingly drawn, because there are so many *Proprietors*, and but a small *Pit*, com-

^a Phil. Trans. N. 66.

paratively to those which have been named above.

Here the *Salt* is boiled in small *Leaden Pans*, and there is not the least grain of *Sand* at any time, which either falls before the *Graining* of the *Salt*, or that adheres to the *Pans* bottoms; ^b notwithstanding what hath been said to the contrary: and therefore this *Brine* being naturally without *Sand*, it must yeild the more wholesome *Salt*.

The *Lower Pit* at the neher *Wich* in the same Town, hath but one Proprietor, as I remember, and therefore is less drawn, but yet is constantly and well wrought.

Here also is no news or knowledge of any *Sand* at all. The water of these *Pits* stinks like *Rotten Eggs*, especially after Sundays rest: And (N. B.) will, if flesh be pickled in them, make it stink in 12 Hours.

And yet the *Salt* that is boiled out of these *Pits* is accounted the very best inland *Salt* of *England*, and I beleive as good as any in the world.

I doubt not but they are *Atramentous*; but I forgot to try them with *Galls*.

I observed in a Ditch over against then ether *Wich*-houses, the water standing with a *White Scum* as at the *Sulphur Spaws* in *York-shire*.

I shall add by way of Corollarie,

1. That all our *York-shire Wells* called *Sulphur Spaws* (which are many) are no other then so many *Brine Pits*, and if they were well drawn and wrought would be as little offensive in smell.

2 That this *Stone-powder* is also to be found adhering to the *Iron-pans*, where the *Sea-water* is boiled into *Salt*, as it is at *Shields* in the Bishoprick of *Durham*; But I do not remember it to be in the lead pans at *Med p* and *Milthrop* in *Lancashire* where the *Sea Sands* are lixiviated, and that *Lixivium* boiled into *Salt*; nor is it remembered in the ac-

^b John Collins S. and Fish p. 8. 52.

count given^c of the making of *Sea-Salt* by *Insolation*; Nor could I observe it in the least in distilling of *Sea-water* in a *Glass still*, or in the *Yorkshire* stinking Wells, of which a good quantity is yearly made for *Medical* use or rather *Curiosity* to vend to Strangers.

N. B. This *Sand* falls to the Bottom before the *Salt* grains.

This is so also in all other *Mineral Salts*, whose Brines being boiled, ever let go first this *stony* part: the *Okar* falls in powder upon the first boiling but the *Lapis Calcareus* rises in flakes like *Wafers*, which yet falls in powder by frost, as we have elsewhere observed.

3. This *Stone powder* irrigated with fair water and kept moist does yeild an immature *Salt* of an uncommon figure; which I have described at large and figured^d.

4. Notwithstanding the great *Affinity* betwixt the *Salt* of the *Midland Brine-Pits* which is *Common Salt*, and the *Sea Salt*: I must not omit (amongst others^e) a *specifick* Difference, which is by me, (that I know of) now first published, and which, in my Opinion, makes the *Sea-Water*, a Water of its own kind: and also shews that none of the Productions of incinerated *Plants* are truly a *Marine Salt*.

The *Angles* of the *Crytals* of *Common Salt*, boiled out of the *Midland Brine-Pits*; as also of *Sal Gem* or *Rock Salt*, which I take to be one and the same, are intire, and so are all those *Lixivated-marine Salts* so called and described by Dr. Grew. But the *Angles* of the *Crytals* of true *Sea Salt* are ever some of them cut off into *Triangular planes*, at least on one of the sides. And this I learnt, by suffering a *Bottle* of *Sea Water*, taken up upon the *Coast* at *Scarborough* where no river near enters it, so evaporate leisurely placed in the shade, after it had been half boiled away: and here all the *Crytals* (which were many,

^c Phil. Transf. N. 51. ^d De Fontib. Med. Angl. edic. 2. ^e N. P. The Inland Brine Pits yeild no: bittern, of which see Mr. Collins. p. 54.

and of different Magnitudes) did yet agree in a like *figure*, as is described.

This *Experiment* I repeated with the like success; and do not doubt, but that it will succeed with any *Sea Water*, which shall be brought from any other part of the world, which this *Society* shall please to direct to be done.

Further, I say that probably the *Sea-water* was the only *Element of Water* created at the beginning. And the congregation of the waters was called *Sea*. *Genes.* 1. that is, before any *Animal* or *Vegetable* was created, or the *Sun* it self. But upon the *Creation* of these the *fresh water* had its rise accidentally, because it owes its being in great part (as I have elsewhere shewn) to the *Vapours* of *Plants* and the *Breath* of *Animals* and the *Exhalations* raised by the *sun*. and by this means the *Rivers* may be furnished from the *Sea* by the *Breath* of its own *Plants* and *Animals*, so as to make what the wise man says very intelligible. *Eccles.* 1. All the *Rivers* run into the *Sea*, and the *Sea* is not full; into the place from whence the *Rivers* come, thither they return again; that is by way of *Exhalation* and *Vapours*.

5. Now that the *Sea water* is made *fresh* by the *Breath* of *Plants* growing in it, I have elsewhere demonstrated thus; I took a long *Glass Bodie* and having filled it pretty full with *Sea-water*, ta'en up at *Scarborough*, I put therein common *Sea weed* (*Alga Marina*) fresh and new gathered, some with the *Roots* naked, and some growing on and adhering to *Stones*: the *Glass Bodie* being full, I put thereon a *head* with a *Beck*, and adapted a *Receiver* thereto, all without any *Lute* or closing the joints; from these *Plants* did distil dayly (tho' in a small quantity) a fresh, very sweet, and potable Water, which hath no *Empegreuma*, or unpleasant taste, as all those distilled by fire necessarily have.

I urge this *Experiment*, as the most *natural*, most easy, and most safe way of having *sweet water* from the *Sea*, and which may be of greater use then perhaps some are apt at the first to fancy, even to supply the *Necessity* of *Navigators*.

6. And I do not doubt but there may be found other *Plants* growing in or near the *Sea* which would better suit the *Experiment* and yeild *fresh water* in much greater quantity; such as *Rock Sampire* the *Kali kind*, or the *Brassica Marina* &c. for all or any of these may be tryed how they will thrive in *Sea water* alone, or planted in earth well and daily wet with it.

Among the known *Sea Plants* the *Sargosse* or *Lenticula Marina*, is not to be forgot; this grows in vast quantities from 36 to 18 *Degrees Northern Latitude*, and elsewhere upon the deepest Seas. And I think (to say something by the by of that great *Phænomenon* of the *Winds*) from the daily and constant breath of that *Plant*, the *Trade* or *Tropic Winds* do in great part arise: because the matter of that *Wind*, coming (as we suppose) from the breath of only one *Plant*, it must needs make it constant and uniform: Whereas the great variety of *Plants* and *Trees* at Land must needs furnish a confused matter of *Winds*: Again the *Levant Breezes* are briskest about *Noon*, the *Sun* quickning the *Plant* most then, causing it to *breath* faster, and more vigorously; and that *Plants* mostly languish in the *night* is evident from many of them, which contract themselves and close at that time; also from the effects of our *Winters* upon them, which cause them to cast both fruit and leaves too; whereas they are said (the same *Plants* for kind) universally to flourish all the year alike within the *Tropicks*.

As for the *direction* of this *Breeze* from *East* to *West*, it may be owing to the *General current* of the *Sea*, for

a gentle *Air* will still be lead with the *stream* of our *Rivers*, for example. Again every *Plant* is in some measure an *Heliotrop*, and bends it self, and moves after the *Sun*, and consequently emits its vapours thitherward, and so its *direction* is in that respect also owing in some measure to the *Course* of the *Sun*.
